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Candidates surname					Other names				
Centre Number					Candidate Number				
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Pearson Edexcel International Advanced Level

Time 1 hour 30 minutes

Paper
reference

WFM02/01

Mathematics

**International Advanced Subsidiary/Advanced Level
Further Pure Mathematics F2**

You must have:

Mathematical Formulae and Statistical Tables (Yellow), calculator

Total Marks

Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 9 questions in this question paper. The total mark for this paper is 75.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

Turn over ►

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blank**1.** Solve the equation

$$z^5 - 32i = 0$$

giving each answer in the form $re^{i\theta}$ where $0 < \theta < 2\pi$ **(4)**

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blank5. Given that $y = \tan^2 x$

(a) show that

$$\frac{d^3 y}{dx^3} = 8 \tan x \sec^2 x (p \sec^2 x + q)$$

where p and q are integers to be determined.

(5)

(b) Hence determine the Taylor series expansion about $\frac{\pi}{3}$ of $\tan^2 x$ in ascending powers of
 $\left(x - \frac{\pi}{3}\right)$ up to and including the term in $\left(x - \frac{\pi}{3}\right)^3$, giving each coefficient in simplest form.

(3)

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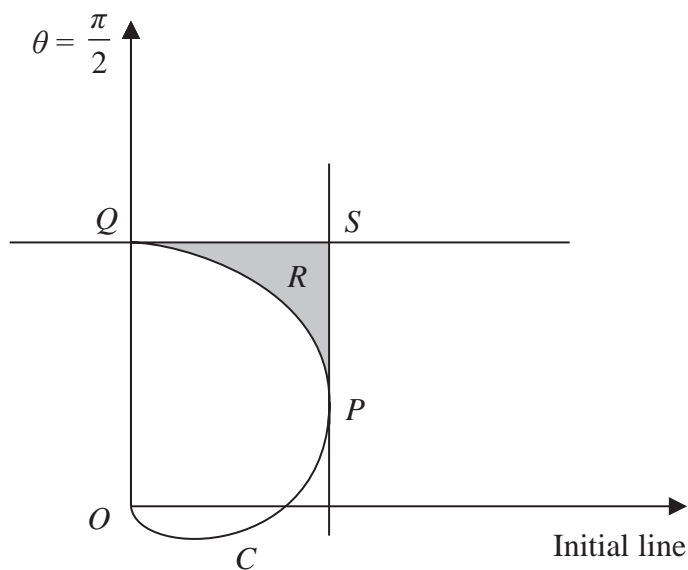


Figure 1

The curve C shown in Figure 1 has polar equation

$$r = 1 + \sin \theta \quad -\frac{\pi}{2} < \theta \leq \frac{\pi}{2}$$

The point P lies on C such that the tangent to C at P is perpendicular to the initial line.

- (a) Use calculus to determine the polar coordinates of P . (5)

The tangent to C at the point Q where $\theta = \frac{\pi}{2}$ is parallel to the initial line.

The tangent to C at Q meets the tangent to C at P at the point S , as shown in Figure 1.

The finite region R , shown shaded in Figure 1, is bounded by the line segments QS , SP and the curve C .

- (b) Use algebraic integration to show that the area of R is

$$\frac{1}{32}(a\sqrt{3} + b\pi)$$

where a and b are integers to be determined. (6)

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